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(54) **Simulated solid fuel gas fires**

(57) A simulated solid fuel gas fire has a plenum chamber 10 with a first cover 12, sealed to the sides 14 of the chamber 10 and itself having first apertures 16 to pass the gas/air fuel upwards, and a refractory second cover 18 above the first cover 12, the second cover 18 having second apertures 20 matching the first apertures so as to have the effect, in use, of drawing most of the gas/air fuel through the second apertures and away from the edges of the first cover 12, the fire being provided with means 24 (or 32, 34 Figs. 3, 4 not shown) to prevent light-back into the plenum chamber 10. The second apertures 20 may be sufficiently long in an upwards direction to give a substantial directivity to the emerging gas fuel. The cover 18 may be stepped upwardly and include air ducts 50.

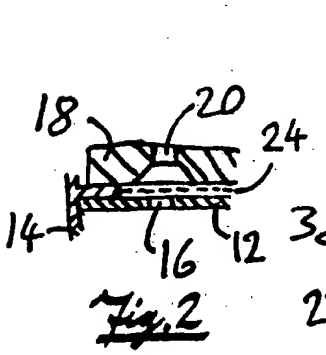

Fig.2

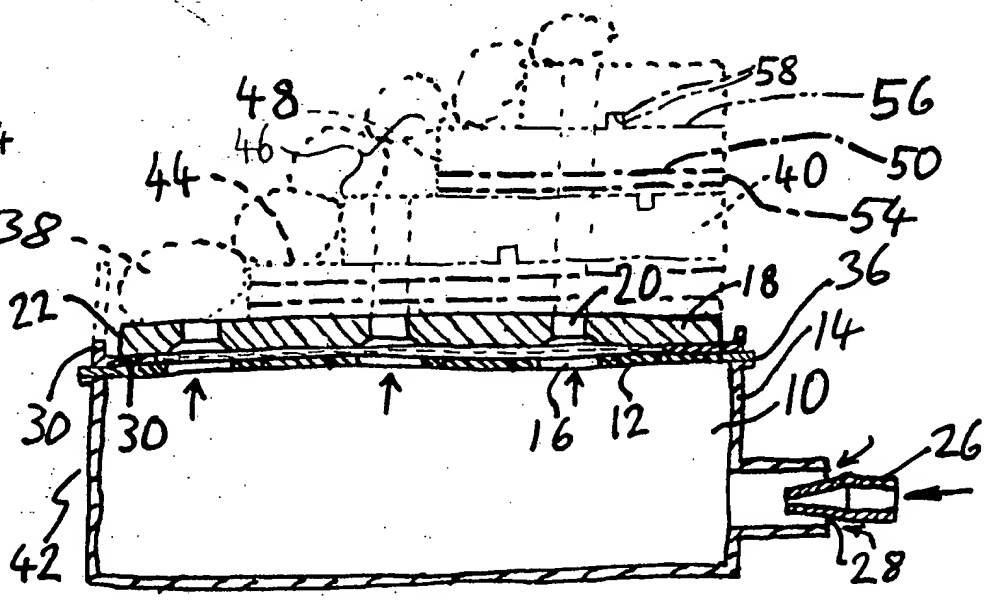

Fig.1

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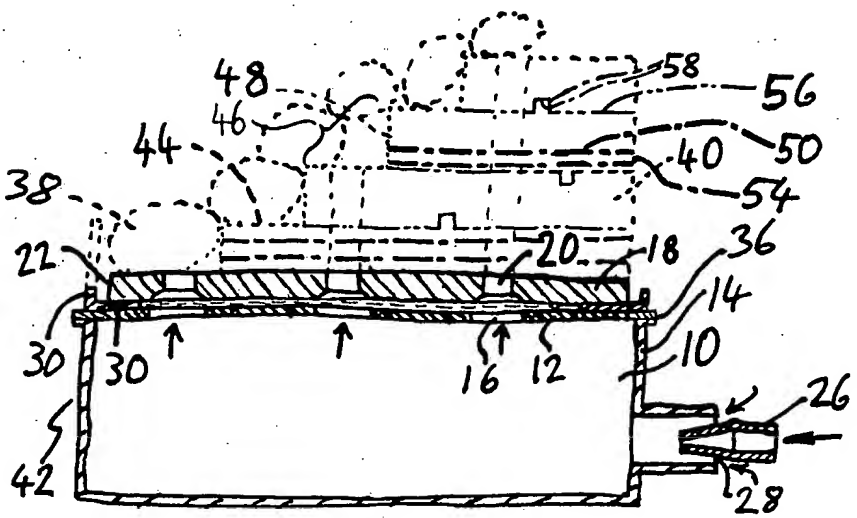

Fig.1

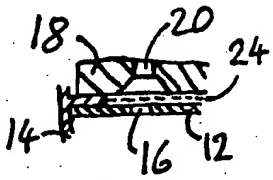

Fig.2

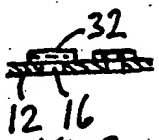

Fig.3

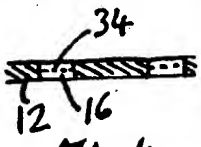

Fig.4

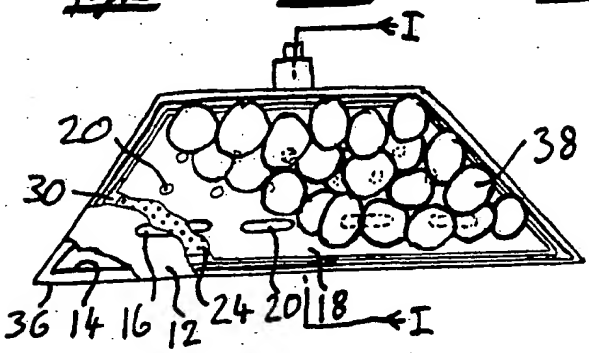

Fig.5

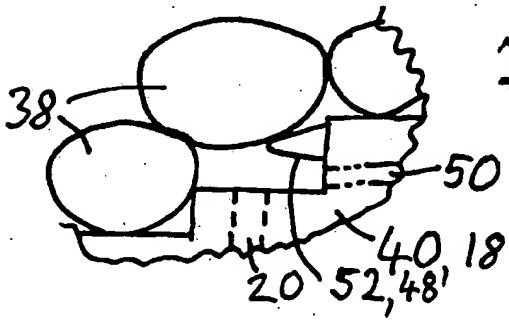

Fig.6

"Simulated Solid Fuel Gas Fires"

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BACKGROUND TO THE INVENTION

This invention relates to gas fires having the effect of fires burning solid fuel, e.g. coals or logs.

Previous such fires have a plenum chamber in which gas fuel is mixed with air and this chamber is covered with a layer of refractory material upon which sits the simulated solid fuel. The refractory layer may be a single piece of porous refractory material but this suffers from the disadvantage that gas escapes around the edge where it is connected to the plenum chamber or else it is securely connected at the edge but this connection breaks down under use because of differential expansion (on heating) between the refractory material and the material of the walls of the plenum chamber. One way to overcome this is to use a layer of particulate material on some sort of perforated support but this is a very messy solution, although widely used.

THE INVENTION

According to the invention, a simulated solid fuel gas fire has a plenum chamber with a first cover, sealed to the sides of the chamber and itself having first apertures to pass the gas fuel upwards, and a refractory second cover above the first cover, the second cover having second apertures matching the first apertures so as to have the effect, in use, of drawing most of the gas fuel through the second apertures and away from the edges, the fire being provided with means to prevent light-back into the plenum chamber. Such a structure prevents gas escape at the edges of the first cover and substantially all gas escape from the edges of the second cover without the need for

the first cover to be of such a material that its seal to the sides of the plenum chamber will necessarily break down and without the mess of a particulate refractory layer.

For the drawing to be fully effective, relatively wide apertures are needed and the fire is therefore provided with specific means to prevent light-back into the plenum chamber. Such means may provide a fine-aperture structure in the region of the first cover and may, more particularly, comprise a fine-apertured sheet covering the first cover or a fine-apertured structure with which each of the first apertures is provided. In the latter case, the fine-apertured structure may be in the form of a piece of fine-apertured sheet attached to the first cover at each first aperture, or each of the first apertures may be in the form of a structure of fine apertures in the first cover. The choice will usually depend on design considerations.

The second apertures may have enlarged entry ports facing towards the matching first apertures. Again, the first apertures may not extend to near the edges of the first cover. Further, the second apertures may be sufficiently long in an upwards direction to give a substantial directivity to the emerging gas fuel, preferably such that the spread of the emerging gas fuel from the second apertures is substantially 30° or less at the point of emergence and more preferably substantially 15° or less, desirably the length in the upwards direction of the second apertures being substantially 2 to 3 cm. These features aid the functional design and appearance and the efficiency of the fire.

The second cover can be loosely mounted in relation to the first

second cover
cover. The / and the remainder of the fire can then contract
differentially
and expand / which tends to increase the life of the fire.

The second cover may be higher at one point than another. Preferably, it slopes up towards the back of the fire. It is particularly useful for it to have a stepped formation. These features may be employed as means to aid forward radiation from the fire and/or means to reduce the quantity of simulated solid fuel elements required.

Reference will now be made by way of example to the accompanying drawings, in which:-

Fig.1 is a vertical section, taken along I-I of Fig.5, of one embodiment of the invention;

Fig.2 is a part section corresponding to Fig.1, showing a detail of the Fig.1 embodiment;

Figs.3 and 4 correspond to Fig.2 but show details of alternative embodiments; and

Fig. 5 is a plan view of the Fig.1 embodiment, partly broken away to show further details.

Referring to the drawings, a simulated solid fuel gas fire has a plenum chamber 10 with a first cover 12 sealed to the sides 14 of the chamber and itself having first apertures 16 to pass the gas fuel upwards, and a refractory second cover 18 above the first cover 12, the second cover 18 having second apertures 20 matching the first apertures 16 so as to have the effect, in use, of drawing most of the gas fuel through the second apertures 20 and away from the edges 22 of the second cover 18 below the latter, the fire being provided with means 24 (see Fig.2) to prevent light-back into the

plenum chamber 10.

The gas fuel is provided by a gas supply pipe 26 and draws air through openings 28 with it into plenum chamber 10, where the air and gas mix. The gas escapes through apertures 16 and 20. When the gas is lighted above apertures 20, member 24 (to be described below) prevents light-back, and the burning of the gas above second cover 18 draws the gas away from the edges 22 of the second cover 18 below the latter, thus tending to prevent unwanted escape of gas from the region of member 24 around the edges 22 rather than the desired escape through its apertures 20. This process is aided by ensuring that the first apertures 16 do not extend to near the edges of first cover 12, as seen in Fig.5.

The means 24 to prevent light-back provide a fine-aperture structure in the region of the first cover 12. As shown in Fig.2, the means comprise a fine-apertured sheet 24 covering the first cover 12. This sheet may be of fine metal gauze, but is preferably a sheet of metal perforated with round holes in a triangular arrangement as seen in Fig.5, the holes preferably having a diameter of 1.5 mm and being spaced 3mm. apart. This sheet 24 may be loosely placed within a rim 30 (to be described below) or may be welded thereto. Alternatively, small portions 32 of sheet material such as sheet 24 just described may be individually welded to first cover 12 to provide each of the first apertures 16 with a fine-apertured structure in the form of a piece of fine-apertured sheet 32 attached to the first cover 12 at each first aperture 16. Alternatively, the first cover 12 may be formed integrally with apertured material 34 in each first aperture 16,

e.g. by forming each aperture 16 as a plurality of small perforations in the sheet material of which first cover 12 is formed. In this case, each of the first apertures 16 is in the form of a structure of fine apertures in the first cover 12. The plenum chamber 10 is formed of sheet metal and the first cover 12 is formed likewise, the two members being welded together around their common rim 36. Above this is welded a rim 30 of L-section, which may have welded to it sheet 24 as described above. The upstanding edge of rim 30 serves to locate and mount loosely the second cover 18 in relation to the first cover 12. The rim 30 may extend upwardly in one or more parts, or all round, as shown in dashed lines in Fig.1, to serve as a retainer for solid fuel elements 38.

The second cover 18 is a ceramic fibre block, e.g. Foseco's "Procal 50" with a high temperature paint as a surface sealant to reduce tendency to break up under heat, which may be, for example, 25mm. thick (when the height of sides 14 is 45mm.), the block having (as seen in Fig.5) a front breadth of 350mm, a back breadth of 255mm. and a depth (back to front) of 135mm. The second apertures 20 are made sufficiently long in an upwards direction (as seen in Fig.1) to give a substantial directivity to the gas fuel emerging from apertures 20, preferably so that the spread is substantially 30° or less at the point of emergence at the top of apertures 20, or more preferably substantially 15° or less. It is considered that a suitable range of lengths in the upwards direction of the second apertures 20 is substantially 2 to 3 cm.

The second cover 20 may be higher at one point than another. It may slope up towards the back of the fire. It may have a stepped

formation. These features are indicated in the extended portion 40 of second cover 18 as seen in dotted lines in Fig.1. The slope may be very slight, e.g. 1 cm. steps, or even only a total of 2 cm. by which the back is higher than the front, with the dimensions given above by way of example. It will be readily seen that this will aid forward radiation from the fire. Also, this will provide means to reduce the quantity of simulated solid fuel elements required. Alternatively, for the latter purpose, there may simply be a central upwardly extended portion of cover 18.

Some or all of the simulated solid fuel elements 38 may be replaced by cavity means elements as disclosed under reference 30 in UK patent specification 2135767 of the present inventor and for the purposes disclosed in that specification.

As seen in Figs. 1 and 2, the second apertures 20 have enlarged entry ports at the bottom facing towards the matching first apertures 16 and may be the same size as the latter (Fig.1) or larger than the latter (Fig.2).

In developments, and in accordance with other respective aspects of the invention, there is provided a refractory material to underlie simulated solid fuel elements of a gas fire and having any one or more of the following features: (a) being stepped with three or more distinct stepped portions, (b) sloping upwardly with two or more distinct interrupted portions, (c) having multiple distinct front portions, one above another, (d) having multiple distinct forward-facing portions, and/or (e) having gas fuel duct means, and air duct means arranged to draw flames back towards forward-facing portions of the material, which portions may be in the form of

forwardly directed teeth, which air duct means may have inlet means at the rear of the material. The material may be in a plurality of separate strata, e.g. one to each step in case (a), which may be keyed together. The strata may be separate castings. By way of example, as seen in Fig.1, cover 18 comprises a refractory material which is one or more hard ceramic castings having a rating of at least 1400°C and preferably at least 2000°C. This, when having the extended portion 40, underlies simulated solid fuel elements 38 of gas fire 42 and has the following characteristics: (a) it is stepped with more than three distinct stepped portions 44, (b) it slopes upwardly with more than two distinct interrupted portions 46, (c) it has multiple distinct front portions 48, one above another, (d) it has multiple distinct forward-facing portions 48, and (e) it has gas fuel duct means 20, and air duct means 50 arranged to draw flames back towards forward-facing portions 48 of the material 18, which portions (52,Fig.6) may be in the form of forwardly directed teeth, and which air duct means 50 may have inlet means 54 at the rear of the material 18 (Fig.1). The material may be in a plurality of separate strata (touching at lines 56,Fig.1), e.g. one to each stepped portion in case (a), keyed together by mating projections and recesses 58, e.g. each stratum being a separate casting. These features may be included in embodiments which do not include the two-cover feature mentioned above.

Reference is made to the disclosure (including claims) of co-pending patent applications No. 8629586 and 8629561 (Serial No. and) ~~(reference CGF2 and CGF3)~~ respectively, lodged on the same day as the present application, features of either or both of which can usefully be combined with

the present invention and embodiments, in view of which the disclosure thereof is hereby imported into the present specification.

CLAIMS

1. A simulated solid fuel gas fire having a plenum chamber with a first cover, sealed to the sides of the chamber and itself having first apertures to pass the gas fuel upwards, and a refractory second cover above the first cover, the second cover having second apertures matching the first apertures so as to have the effect, in use, of drawing most of the gas fuel through the second apertures and away from the edges of the second cover below the latter, the fire being provided with means to prevent light-back into the plenum chamber.

2. A fire as claimed in claim 1, in which the means to prevent light-back provide a fine-aperture structure in the region of the first cover.

3. A fire as claimed in claim 2, in which the means to prevent light-back comprise a fine-apertured sheet covering the first cover.

4. A fire as claimed in claim 2, in which the means to prevent light-back comprise a fine-apertured structure with which each of the first apertures is provided.

5. A fire as claimed in claim 4, in which the fine-apertured structure is in the form of a piece of fine-apertured sheet attached to the first cover at each first aperture.

6. A fire as claimed in claim 4, in which each of the first apertures is in the form of a structure of fine apertures in the first cover.

7. A fire as claimed in any preceding claim, in which the second apertures have enlarged entry ports facing towards the matching first apertures.

8. A fire as claimed in any preceding claim, in which the first apertures do not extend to near the edges of the first cover.

9. A fire as claimed in any preceding claim, in which the second apertures are sufficiently long in an upwards direction to give a substantial directivity to the emerging gas fuel.

10. A fire as claimed in claim 9, in which the length in the upwards direction of the second apertures is sufficient for the spread of the emerging gas fuel from the second apertures to be substantially 30^{o} or less at the point of emergence.

11. A fire as claimed in claim 10, in which the spread of the emerging gas fuel from the second apertures is substantially 15^{o} or less at the point of emergence.

12. A fire as claimed in any one of claims 9 to 11, in which the length in the upwards direction of the second aperture is substantially 2 to 3 cms.

13. A fire as claimed in any preceding claim, in which the second cover is loosely mounted in relation to the first cover.

14. A fire as claimed in any preceding claim, comprising means to aid forward radiation from the fire.

15. A fire as claimed in any preceding claim, comprising means to reduce the quantity of simulated solid fuel elements required for the fire to simulate the appearance of a solid fuel fire.

16. A fire as claimed in any preceding claim, comprising cavity means as and for the purposes disclosed in UK patent specification 2135767.

17. A fire as claimed in any preceding claim, in which

the second cover is higher at one point than another.

18. A fire as claimed in any preceding claim, in which the second cover slopes up towards the back of the fire.

19. A fire as claimed in any preceding claim, in which the second cover has a stepped formation.

20. A refractory material to underlie simulated solid fuel elements of a gas fire and being stepped with three or more distinct stepped portions.

21 A refractory material to underlie simulated solid fuel elements of a gas fire and sloping upwardly with two or more distinct interrupted portions.

22. A refractory material to underlie simulated solid fuel elements of a gas fire and having multiple distinct front portions, one above another.

23. A refractory material to unerlie simulated solid fuel elements of a gas fire and having multiple distinct forward-facing portions.

24. A refractory material to underlie simulated solid fuel elements of a gas fire and having gas fuel duct means, and air duct means arranged to draw flames back towards foward-facing portions of the material.

25. Material as claimed in claim 24, in which said portions are in the form of forwardly directed teeth.

26. Material as claimed in claim 24 or 25 in which the air duct means have inlet means at the rear of the material.

27. Material as claimed in any one of claims 20 to 26, which is in the form of a plurality of separate strata.

28. Material as claimed in claim 27 when appended to claim 20, in which there is one of said strata to each stepped portion.

29. Material as claimed in claim 27 or 28, in which the separate strata are keyed together.

30. Material as claimed in any one of claims 20 to 29, in the form of one or more hard ceramic castings.

31. A fire comprising material as claimed in any one of claims 20 to 30.

32. A fire substantially according to any example hereinbefore described.

33. A fire substantially according to any example hereinbefore described with reference to and illustrated in the accompanying drawings.

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